

Notice of Allowability

Application No.

09/911,083

Examiner

Mark Ruthkosky

Applicant(s)

HWANG ET AL.

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 4/14/2004.
2. ☒ The allowed claim(s) is/are 3-7, 9-16, 19-22, 26, 27 and 30-39.
3. ☒ The drawings filed on 24 July 2001 are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☒ All b) ☐ Some* c) ☐ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Mark Ruthkosky 5/17/04
Mark Ruthkosky
Primary Patent Examiner
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DETAILED ACTION

Specification

The applicant has overcome the objection to specification. The applicant has removed the limitation that the second component solvent has a sulfur solubility of greater than 0.5mM.

Claim Rejections - 35 USC § 102

The rejection of claims 1, 3, 5-7, 11, 13-17, 19, 20-23, 26-28, and 30-33 under 35 U.S.C. 102(b) as being anticipated by Griffin et al. (US 5,552,244) has been overcome by the applicant's amendment.

Claim Rejections - 35 USC § 103

The rejection of claims 4 and 12 under 35 U.S.C. 103(a) as being unpatentable over Griffin et al. (US 5,552,244) as applied above, and further in view of Omaru (US 5,437,945) has been overcome by the applicant's amendment.

Allowable Subject Matter

Claims 3-7, 9-16, 19-22, 26-27, and 30-39 are allowed.

The following is an examiner's statement of reasons for allowance:

The instant claims are to an electrolyte for a lithium sulfur battery having a positive and negative electrode comprising a first solvent component with a sulfur solubility greater than 20 mM; a second solvent component with a sulfur solubility less than 20 mM and greater than

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0.5mM; a third solvent component with a high dielectric constant and a high viscosity and an electrolyte salt. The first component solvent is substantially between 5-30% (vol.) of the electrolyte. The second component solvent is substantially between 20-70% (vol.) of the electrolyte. The third component solvent is substantially between 20-70% (vol.) of the electrolyte. The prior art does not teach an electrolyte for a lithium sulfur battery comprising a solvent mixture of these materials in the concentrations claimed. The specific concentration ranges both improve the sulfur solubility and the charge transfer characteristics of the electrolyte as noted on page seven of the instant specification.

The most pertinent art includes Griffin et al. (US 5,552,244), which teaches an electrolyte for a lithium sulfur battery having a positive and negative electrode comprising a first solvent component with a sulfur solubility greater than or equal to 20 mM; a second solvent component with a sulfur solubility less than 20 mM; a third high dielectric constant and high viscosity solvent component, and an electrolyte salt. Tetrahydrofuran, ethanol, propylene carbonate and mixtures thereof are noted. Tetrahydrofuran is shown in the specification as a first solvent component with a sulfur solubility greater than 20 mM. Ethanol is shown in the specification as a second solvent component with a sulfur solubility less than 20 mM. Propylene carbonate is shown in the specification as a third solvent component with a high dielectric constant and a high viscosity. Metal salts are noted at the top of column 4 (col. 3, line 45-col. 4, line 15.) It is further noted that a mixture of water, ethanol and propylene is noted at the top of column 5. The electrolyte is not taught to be in the component concentrations as claimed.

Omaru (US 5,437,945) teaches an electrolyte for a secondary battery which is made of two solvent components, which correspond to the claimed second solvent component with a

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sulfur solubility less than 20 mM (DMC and DEC are noted as examples in col. 3 and col. 6), and the third solvent component (such as EC and PC) with a high dielectric constant and a high viscosity and an electrolyte salt (see claim 5 for example.) The electrolyte further includes a lithium salt as noted in the present invention that is included in a concentration of about 0.6 to 1.8 mol/L. In example 1, the mixed solvent is added in a 1:1 ratio and the concentration is 1mol/L. It is further noted that other solvents may be mixed with or substituted in the electrolyte including THF and Me-THF. The electrolyte is not taught to be in the component concentrations as claimed.

The allowed claims include specific concentrations of each component in the solvent mixture. The prior art does not teach the components in specific amounts. For example, tetrahydrofuran, ethanol, propylene carbonate and mixtures thereof are noted in Griffin et al. (US 5,552,244,) however, no specific mixtures of the three components or proportions of each element are taught. With regard to claims 9-10, 13, 35, and 37-38, the reference does not teach an additional additive to the electrolyte, which will form a solid electrolyte interface at the surface of the anode.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Examiner Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mark Ruthkosky
Primary Patent Examiner
Art Unit 1745

Mark Ruthkosky
5/17/04